Ancient military technology

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Military technology is a complex concept. What do we mean by the term 'technology'? What forms of technology would have been familiar to ancient Greek and Roman soldiers? How was it made? What sort of technology was used in siege warfare? Surprisingly, some of the simplest technologies also proved the most effective...

The stereotype of the ancient warrior is an infantryman: a Greek hoplite bearing shield and spear or a Roman legionary bearing a shield and sword. Ancient battles are envisaged as bloody affairs in which men attacked each other at very close range, and the possible yield for a day's work was death, wound, or enslavement. Technology is not very noticeable in these images. But that is partly because we tend to use the word 'technology' to refer only to new or not-understood devices, while old or familiar technology is called something else and taken for granted – do you ever call a tap, or a car, or the oven in your kitchen, for example, technology? But when we stop to think about it, we recognise that they are technologies, albeit more or less old, and how they work is more or less understood. So we should try to overcome this 'tech = high-tech' tendency, and recognise that the ancient infantryman carried quite a bit of technology about his person.

How was it made?

It took extraordinary skill to hammer a single piece of bronze into a strong and shining helmet, for example. Or consider the legionaries' shield. How do you make a large board – which has to be strong enough to withstand the cut and thrust of battle – curved like that? You make it of layers of *thin* wood, which you first cut (imagine doing that with a hand-saw), and then wet, bend into shape, and hold to dry in that shape, and then you stick the slats together in layers with different orientations. Plywood and bent wood are ancient technologies.

Simple but effective refinements to basic military technology included strings wound around the shaft of Greek javelins, which imparted spin to the javelin in much the same way as a string is used to spin a top. Javelineers held a loop of string with their index and middle fingers (see right), and as the javelin was launched, and the throwing arm whipped down, the rapidly unwinding string would cause the javelin shaft to rotate, which should have improved the accuracy of the throw. One can imagine that it took significant practice to get this technology working well.

A great deal of skill and training was also required to make bows and arrows. It takes about a year to make a good compound bow; the wood has to be carefully selected and harvested, then seasoned, and worked intermittently to complete each stage of manufacture at an appropriate time given local conditions which altered the rate at which the glue that held the different layers of wood, horn, and sinew together dried. Again, to make a single arrow requires significant time spent selecting, harvesting, and shaping wood or reed shafts, and the talents of an iron-smith to make the head. Specialist fletchers emerged over time to make the feather flights en masse for military consignments, but archers usually acquired the necessary skills to fletch their own arrows.

Siege machinery

More robust military technologies included siege machines, for offence and defence. These included bronze-headed rams to batter gates, walls, and wooden superstructures at the top of walls; borers to drill through mud-brick walls; tunnels to undermine walls or provide secret access to the city; catapults to shoot men defending or attacking walls, and to destroy other war machines; siege towers to overlook walls and shoot down on defenders; simple and complex scaling ladders to try to surmount the walls or simply look over them and see what the defenders were up to; and sheds and screens to protect men busily engaged on destruction of enemy resources. Illustrations of some of these can be found in the Hunterian Collection at Glasgow University. Siege technologies were probably unfamiliar to the average ancient-in-the-street, who was unlikely to ever be involved in a siege. Few Greek wars involved a siege of a fortified settlement, and the Romans typically conquered an area with very few sieges relative to the number of settlements. Philip II observed that a donkey laden with gold was an easier way in to a hostile city, and Alexander's siege of Tyre stands out because it involved such conspicuous consumption of men and material. Archimedes versus the Romans at Syracuse is a similarly unusual example. So these technologies were probably not common knowledge, which explains why technical treatises that tell the reader how to build them were written and survive.

Ancient military handbooks

The best of these in terms of comprehensiveness and clarity is Philon's *Belopoiika*, literally meaning 'throwing-[machine] making' and otherwise known as 'engine making'. (I resist translating it 'artillery construction' because artillery means 'large-calibre weapons', and the machines described are not necessarily large; we are misled into expecting them to be big because of this translation.) Heron's / Ktesibios' *Belopoiika* is good too, and Biton's *Construction of war machines and catapults* includes other devices. They supply quite enough information to allow you to build your own catapult (of one or other of several different designs), or mechanical scaling ladder (*sambuca*), or city-taker (*helepolis*). Ktesibios also tells his reader about the early development of the catapult, and Philon also tells the reader the principles upon which a good catapult is based, specifically, how to get the power-to-weight ratio right so that the machine you build can most effectively deliver the ammunition you intend to use. (These are known as the catapult *formulae* in much modern writing on the topic.) Most of the construction can be undertaken with materials readily available then and now, but there is also a small amount of metalwork that can be tricky for modern students to source or substitute, as it probably was for ancient would-be catapult-builders too.

As early as Homer's society, where Odysseus built his own house and bed for example, metalwork required a specialist metallurgist. It was extraordinarily diffi-

cult to produce metal, which is a key, if small, part of most armour and weapons. It required the generation of temperatures high enough to melt rock, and the artificial re-creation of the sort of conditions normally found inside a volcano. Given the inability of most ovens to get this hot and of most materials to hold any molten metal that resulted, most people would not have had the means to make these parts, even had they been inclined to. It would be like trying to melt the saucepan, instead of boiling something in it, and a bonfire is not going to be adequate to that task. Without training we have no idea even where to begin with metallurgy – and we have no surviving ancient technical treatise telling us how to make metal.

Defence technology

Less obvious military technologies are found in armour. The *linothorax* was body-armour made of linen (hence the name). If you were looking round for some strap-on protection for your torso, tea-towels might seem an odd choice. However, flax fibres are surprisingly tough in themselves, and when woven together they make a very strong fabric. Glue and press several layers together, and you can transform this textile in the same way that thin layers of soft wood glued and pressed together make strong plywood. The *linothorax* was also light – it was probably similar in weight to a leather cuirass, and much lighter than a metal corslet – so it allowed the fighter wearing it to be more mobile, which might prove crucial in a battle.

Traps, pitfalls, and deterrents are also well attested ancient military technologies. A particularly nasty but very simple little device was the *tribolos*, known as a caltrop or crow's foot in later times (see below), and which is probably still being used in warfare (an example in service in the British military until 1964 (!) can be seen in the Royal Engineers Museum in Chatham). This consists essentially of four nails welded together at their heads, so that their points make a pyramid shape. The construction ensures that however they land on the ground, three points will face down and give stability to the fourth, which will point up. These could be made in any size, as required for the given target, just as modern mines may be designed as anti-personnel or anti-tank or whatever in between. Little ones could be sown (broadcast, like grain) to create a sort of minefield to stop men approaching from a given direction. A strong thick sandal sole might prevent penetration if one was walking gingerly, but soldiers charging over open ground don't normally walk like that. Bigger versions were scattered to stop cavalry. Horses could also be brought down by creating pot-fields, burying lots of small pots into which they could put a foot and break a leg. Really big pots could be buried in a line in front of the city wall and in range of it, to act as a sort of tank trap for any machinery brought against the wall, which would become a sitting duck for defenders on the wall.

Finally, it is important to remember that all manner of civil or domestic technologies can be adapted or applied to destructive instead of constructive use. The concept of an IED is not new; Aeneas Tacticus tells his reader how to transform various domestic implements into weapons and anti-siege devices. Most technology can be turned into military technology with a little imagination – and the ancient Greeks and Romans were never short of imagination!

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